

# COMMONLY USED DISINFECTANTS IN TANZANIA

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## Introduction

Besides heat sterilization and heat disinfection, chemical disinfectants play a role in dental practice. Disinfection of the surrounding area of the surgery and all equipment is important in order to prevent cross-infection.

Antiseptics and disinfectants are generally used to destroy or inhibit the growth of pathogenic microorganisms in the non-sporing state. In practice an *antiseptic* is an agent that counters sepsis by destroying all living microorganisms, while a *disinfectant* is an agent which destroys pathogenic microorganisms, but not usually bacterial spores. The term is normally applicable to agents used to treat inanimate objects and materials.

## Precautions regarding the use of antiseptics and disinfectants

A proper application of disinfectants and antiseptics is very important to make use of the full power and impact of these agents on microorganisms. Aqueous solutions of antiseptics are liable to become contaminated with resistant microorganisms in the process of preparing, storing or using them. Therefore the following precautions should be taken:

1. Always read the instructions and labels when dealing with chemical disinfectants, since there are many factors which can affect the activity of a disinfectant, namely:
  - a. Temperature, eg. action of formaldehyde increases with temperature.
  - b. Concentration, eg. the action of cationic surfactants is either bacteriostatic (growth inhibition) or bactericidal (killing) depending on concentration.
  - c. Hydrogen ion concentration (pH), eg. cationic surfactants are inactive in acid media.
  - d. Exposure time, eg. chlorine containing

disinfectants may disinfect in 5 minutes but at least 6 hours are required to achieve aseptic conditions.

- e. Presence of other substances, particularly organic substances, eg. blood, saliva, may reduce the activity of disinfectants.
  - f. Exposure to light and oxygen reduces activity particularly of disinfectants with an oxidation action.
2. Solutions must be prepared with fresh (boiled) water in clean containers (preferably sterile).
  3. Cork stoppers or cork lining stoppers should not be used since they affect the activity of disinfectants or in case they are wet, they can be passed by microorganisms. Instead, glass or rubber stoppers must be used.
  4. Contents should not be used later than seven days after first opening a container.
  5. Solutions of antiseptics for application to broken skin or to the eyes or mucosal surfaces should be *sterile*.
  6. Solutions of some antiseptics should not be applied repeatedly to the skin or left in contact through wet dressings to avoid the development of skin sensitivity.

## Dilutions and uses of different disinfectants

1. Cationic surfactants
  - 1.1 Cetrimide strong solution (40% w/v). It is a stock solution containing cetrimide, alcohol and tartrazine. The alcohol prevents against possible bacterial contamination, especially by *Pseudomonas* species.

Precautions:  
It is incompatible with soap.

Dilutions and uses:  
- 0.5% v/v solution in 70% alcohol is used for hand cleaning and pre-operative skin disinfection.
  - 1.2 Savlon hospital concentrate. It contains

cetrimide 15% and chlorhexidine gluconate 1.5%.

**Precautions:**

It should not be used for instruments containing glass to metal connections. It corrodes metal instruments, which can be prevented by adding 4 gram/litre sodium nitrite. It should not be applied for long periods on rubber tools.

**Dilutions and uses:**

- 0.5% v/v solution is used for general antiseptic purposes, for disinfection of hospital equipment, for 30 minutes disinfection of instruments and for storage of instruments.

- 1% v/v solution is used for hand rinsing, and disinfection of wounds and burns.

- 3.3% v/v solution is used for disinfection of dirty wounds and burns and for the cleaning of instruments and rubber tools prior to sterilization.

- 3.3% v/v solution in 70% alcohol is used for pre-operative skin disinfection and for emergency disinfection (2 minutes) of instruments.

2. Chlorhexidine Gluconate (Hibitane®). For general disinfection purposes a mixture of chlorhexidine and cetrimide (see above) in the form of Savlon is often used.

**Precautions:**

Commercial stock solutions containing surfactants (surface wetting agents eg. cetrimide) are not suitable for use on mucous membranes. Its bactericidal effect is reduced in the presence of organic material (blood and saliva).

**Dilutions and uses:**

- 0.5% v/v solution in 70% alcohol for emergency disinfection (2 minutes) of cleaned instruments.

- 0.05% v/v aqueous solution as wound antiseptic.

- 0.02% v/v solution with 0.1% sodium nitrite for storage of sterilized instruments.

- 0.1 - 0.2% v/v solution for mouth rinse.

3. Chloroxylenol (Dettol®)

**Precautions:**

It is less active against Staphylococci and almost inactive against certain Gram-

negative bacteria and bacterial spores. Its activity is reduced in the presence of organic material (blood and saliva). It corrodes metal and should therefore only be used for stainless steel instruments.

**Dilutions and uses:**

- 4.8% v/v solution in 70% alcohol for emergency disinfection (1 minute) of instruments.

- 2% v/v solution in 70% alcohol for storage of instruments in glass vessels (not in metal trays because of corrosion).

- 1% v/v solution in 70% alcohol for disinfection of rubber appliances.

4. Cresol (Lysol®), 50% v/v cresol in soap solution is a good general disinfectant for inanimate objects.

**Precautions:**

Like all disinfectants also cresol expires. This can easily be observed since a fresh solution is colourless to pale brownish, but after time the colour will change to dark brown. It is irritant to the skin. Its activity is reduced in the presence of organic material (blood and saliva).

**Dilutions and uses:**

- 0.6 - 3% v/v solutions are the cheapest disinfectants for general environmental use.

5. Phenol or carbolic acid, 16% w/w phenol in glycerine.

**Precautions:**

Its bactericidal effect is reduced in the presence of organic material (blood and saliva). It is destructive to tissue and should not be applied to the skin. It must be diluted with glycerine before use.

**Dilutions and uses:**

- 0.2 - 0.5% v/v solutions are used for mouth rinse and gargling.

6. Halogens

6.1 Chlorine compounds: The disinfective activity depends on the available chlorine which exerts an oxidation activity.

6.1.1 Chlorinated lime and boric acid (Eusol - 0.38% w/w available chlorine).

**Precautions:**

It should be prepared daily since it is unstable and it must be stored in air tight

containers, protected from light. It is corrosive to metals and irritating to skin and other tissues.

6.12 Sodium hypochlorite solution (4 - 6% w/w available chlorine).

It is effective against a wide variety of microorganisms including viruses. It is a quick disinfectant for HBV and HIV.

Precautions:

As under 6.1.1.

Dilutions and uses:

- 10,000 ppm solution (1% w/w available chlorine) is used to disinfect spillage of blood and other body fluids.

- 1,000 ppm solution (0.1% w/w available chlorine) is used for decontamination of surfaces as part of general hygienic practice.

## 7. Dyes

7.1 Potassium permanganate solution.

Precautions:

Should be freshly prepared since it quickly loses its oxidising property.

Dilutions and uses:

- 1 in 20 solution has powerful styptic action.

- 1 in 1000 solution for disinfection of ulcers and abscesses.

- 1 in 4000 solution for gargle and mouth wash.

7.2 Proflavine solution, 0.1% w/v solution in water for the treatment of infected wounds and burns. It is a slow-acting disinfectant.

7.3 Gentian violet solution, 0.5% w/v solution in water for anti-septic procedures.

## 8. Alcohols

8.1 Tincture Benzoin compound. It is a disinfectant with protective property to the wound.

8.2 Industrial methylated spirit 70% v/v solution is a general disinfectant.

8.3 Ethyl alcohol 70% v/v solution is a general disinfectant.

Precautions:

Alcohol must always be diluted to 70% v/v with water to make it an effective disinfectant.

## 9. Peroxides

9.1 Hydrogen peroxide (30% w/w to 80% w/w

solutions).

Precautions:

Strong solutions are causing burns on skin and mucous membranes. Not effective for instrument disinfection. It must be freshly prepared and stored in dark containers, protected from light.

Dilutions and uses:

- 6% v/v solution to clean wounds.

- 1.5% v/v solution for mouth wash and gargle solution.

## 10. Aldehydes

10.1 Formaldehyde solution (34 - 38% v/v).

Precautions:

It irritates the skin and eyes.

Dilutions and uses:

- 2 - 8% v/v solutions in water to disinfect hospital equipment.

10.2 Glutaraldehyde 2% (Cidex®). It is a very effective disinfectant and if exposed to equipment and instruments for 10 hours it kills all microorganisms including spores. It does not affect plastic and rubber.

Precautions:

It should not be used as a surface disinfectant since its vapour is very toxic. The wearing of heavy duty gloves when handling the solution is recommended.

## Recommendations

While the above 10 groups of disinfectants/antiseptics should suffice for most of the activities in a hospital, the need for others may exist eg. more potent, cheaper and more durable. New disinfectants should be investigated with microbiological tests and should be approved by the Pharmaceuticals and Therapeutics Committee of the hospital and also at the national level.

Because of the nature of the work in a dental surgery, in that, many patients have infections, a disinfectant/antiseptic policy should be prepared and strictly adhered to in order to prevent cross-infection and induction of resistant microorganisms.

Disinfectants and antiseptics are medicines and therefore their proper storage and procurement should be under the hospital pharmacy to prevent their misuse. At this juncture, I would like to propose some

**Table 1 Decontamination procedures (not sterilization) in the dental surgery with chemical disinfectants**

<b>Instruments and equipment</b>	<b>Application and dilution of disinfectants</b>	<b>Exposure time</b>
<b>Bowl (kidney)</b>	<b>Immerse in:</b>	
<b>Instrument trays</b>	<b>Glutaraldehyde 2%*</b>	<b>20 minutes</b>
<b>Containers</b>	<b>Chlorhexidine 0.5% in 70% alcohol</b>	<b>20 minutes</b>
	<b>Savlon 3.3% in 70% alcohol</b>	<b>20 minutes</b>
<b>Dental chair</b>	<b>Clean with paper towel</b>	
<b>Operation lamp</b>	<b>impregnated with:</b>	<b>between patients</b>
<b>X ray equipment</b>	<b>Chlorhexidine 0.5% in 70% alcohol</b>	
<b>Surfaces for instruments</b>	<b>Savlon 3.3% in 70% alcohol</b>	
<b>Cabinets</b>	<b>and let it dry</b>	
<b>Handpieces</b>	<b>Clean outside surface with water and soap, but avoid total immersion, then wrap handpiece in paper towel or gauze impregnated with:</b>	
	<b>Chlorhexidine 0.5% in 70% alcohol</b>	<b>20 minutes</b>
	<b>Glutaraldehyde 2%</b>	<b>20 minutes</b>
	<b>Savlon 3.3% in 70% alcohol</b>	<b>20 minutes</b>
	<b>Afterwards rinse with water prior to re-use</b>	
<b>Floor of surgery</b>	<b>Mopping with:</b>	
	<b>Cresol in soap solution 3% (Lysol ®)</b>	<b>morning and afternoon</b>
	<b>Soap in water solution</b>	

\* Should only be used in closed containers since its vapour is very toxic.

decontamination procedures for dental equipment and dental instruments as well as for surfaces in the surgery that cannot be heat sterilized (Table 1). One must remember that most chemical disinfectants are inactivated by organic matter. Therefore equipment and instruments to be disinfected must be first thoroughly cleaned so as to attain maximum effect of the disinfectant. Moreover, most disinfectants are inactive against bacterial spores and viruses. For those few that are

effective a right concentration and prescribed exposure time must be practised. So antiseptic disinfectants like chlorine solutions and glutaraldehyde cannot kill spores in 10-20 minutes. They are effective disinfectants since in a 10-20 minutes timespan they kill all pathogens except the spores. For spores to be killed, exposure times of 10 hours are needed. So complete aseptic conditions will not be achieved within 10 hours.